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Documents de Travail du
Centre d'Economie de la Sorbonne

CES Working Papers

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2012.74

Maison des Sciences Économiques, 106-112 boulevard de L'Hôpital, 75647 Paris Cedex 13
http://centredeconomiesorbonne.univ-paris1.fr/bandeau-haut/documents-de-travail/
ISSN : 1955-611X

Spouses' Retirement and Hours of Work Outcomes: Evidence from Twofold Regression Discontinuity

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November 2012

Abstract

Earlier studies conclude that spouses time their retirement closely together. Here, we exploit early retirement age legislation to identify the effect of own and spousal retirement on spouses' hours of work. The sample for the analysis includes over 85 000 French couples. We conclude that hours of work fall significantly upon own and partner's retirement, for both spouses. The own effect is dramatically large and equal to a drop in hours worked of 65 to 77 per cent while the cross effects are small, suggesting an average reduction of one or two hours per week upon spousal retirement.

Résumé

Les précédentes études ont conclu que les conjoints liaient leurs choix de départ en retraite. Ici, nous utilisons la législation sur les départs anticipés en retraite pour identifier les effets du choix de retraite d'un individu et de son conjoint sur le temps de travail d'un conjoint. L'échantillon de l'analyse comprend 85000 couples français. Nous en concluons que le temps de travail est significativement réduit par les choix propre et du conjoint de départ en retraite, et ce pour les deux conjoints. L'effet propre est très important et égal à une baisse des heures de travail de 65 à 77 pour cent tandis que l'effet croisé est faible, de l'ordre de une à deux heures en moyenne par semaine lors de la retraite du conjoint.

Keywords: Ageing, Retirement, Regression Discontinuity, Policy Evaluation
JEL classification: J14, C1, C36, D04

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[†] This paper was written while visiting Cambridge University. I am indebted for suggestions to Arthur Lewbel, Hamish Low, Nicolas Moreau and Arthur van Soest. All errors are mine.

1. Introduction

There is growing interest in the retirement strategies of individuals in a couple. Earlier studies conclude that spouses time their retirement closely together and this phenomenon is referred to in the economic literature as "joint retirement". Here we exploit the early retirement law in France to investigate the causal effect of a spouse's retirement on the other spouse's hours of work, taking a regression discontinuity approach.

The literature on joint retirement decisions of partners is growing fast. Earlier studies conclude that partners tend to retire together because of leisure complementarities and that financial incentives play a lesser role in explaining spouses' joint retirement decisions (see, for example, Michael Hurd , 1990; Alan Gustman and Thomas Steinmeier , 2000; Maria Casanova, 2010).[1] Recent work though highlights asymmetries in spouses' retirement strategies. Gustman and Steinmeier (2009) incorporate partial retirement strategies in a discrete choice model of spouses' retirement to conclude that in numerous situations individuals in a couple may decide to retire only if their spouse does not retire. Using data drawn from the Health and Retirement Study (HRS), they find that the increased labour force participation of American women has actually contributed to lower husbands' hours of market work. Stancanelli and Van Soest (2012a) find striking asymmetries in the change in house work hours of partners upon retirement. In addition, Stancanelli and Van Soest (2012b), using actual data on partners' leisure hours, conclude that the increase in joint spouses' leisure hours upon spousal retirement is much smaller than the increase in separate leisure.

Institutions are likely to affect spouses' retirement decisions. David Blau (1998) concludes, for example, that eliminating dual entitlement to social security benefits would have a significantly positive effect on the labour supply of married women and a negative one on husbands' labour supply, though both effects would be small. Baker (2002) studies the effect of the introduction of an allowance for dependent spouses in the Canadian social security system, finding a negative effect on the participation rates of eligible women and their husbands . Kanika Kapur and Jeannette Rogowski (2007) investigate the effect of employer-provided retiree health insurance (assumed exogenous by the authors) on the retirement

[1] See Gruber, Jonathan and David Wise (2005) for a complete overview of retirement patterns all over the world.

behaviour of dual-earners in the USA, findings evidence of asymmetric effects for partners: the wife's health insurance increases joint retirement while the husband's does not. James Banks, Richard Blundell, and Maria Casanova Rivas (2010) compare retirement behaviour of American and British dual-earners (using American husbands as a control group for British husbands) to conclude that British husbands are significantly more likely to retire when their wife reaches state pension age. These studies did not exploit exogenous variation in the retirement decision of both partners as we do here.

In this paper, we study the causal effect of spouses' retirement on spouses' hours of work taking a regression discontinuity approach. Using a regression discontinuity approach has the advantage of being closer to a natural random experiment design than other quasi-experimental methods (see, for example, David Lee and Thomas Lemieux, 2010, for a discussion). We use the discontinuity in each spouse's retirement probability at the legal early-retirement age in France to identify the effect of retirement in our model. We also control for a 1993 policy change that increased the length of the pension contribution period required to be able to retire with the maximum (full) pension benefits for younger cohorts. [2] The 1993 reform is likely to have reduced the probability to retire at the legal early retirement age for younger cohorts. Therefore, we specify an instrumental variable model of the effect of own and spousal retirement on spouses' hours. The data for the analysis are drawn from the French Labour Force Surveys (LFS). We select a sample of dual-earners or retiree couples with both spouses aged between 50 and 70 years, encompassing over 85000 couples.

We find evidence of large and significant jumps in the own retirement probability at the legal early retirement age for both the man and woman in a couple. The 1993 reform slightly reduced the probability of retirement at the early retirement age for married men while this effect was not significant for married women. The husband's retirement probability increases slightly when the wife reaches early retirement age while her retirement probability is not responsive to his early retirement age. Finally, we conclude that hours fall significantly upon own and spousal retirement for both spouses. The own effect is dramatically large and equal to a drop in hours worked of 65 to 77 per cent while the cross effects are smaller, suggesting an average reduction of one or two hours per week upon spousal retirement.

[2] See, for example, Antoine Bozio (2004), who studied the effect of the 1993 reform on the retirement age of individuals, using a cross-section of French administrative data on pension contribution records, and taking a differences-in-differences approach, to conclude that those affected by the reform postponed their retirement significantly.

2. The empirical model

2.1 The RD design

Our objective is to study the causal effect of spouses' retirement on spouses' hours. We are especially interested in the cross effects: does his (her) retirement after her (his) hours? Individuals' hours decisions are unlikely to be independent from retirement decisions. Therefore, to identify the effect of retirement on hours of work, we exploit exogenous variation in retirement due to the discontinuity in the individual retirement probability at age 60, which is the legal early retirement age for most workers in France.[3] There are no other policies that affect individuals of age 60 in France; [4] and age presumably cannot be manipulated by the respondents. Moreover, we know the individual month and year of birth as well as the day, month and year of the interview, and retirement status is also measured on the day of the interview. We thus can assume that age is measured continuously.

We use a Regression Discontinuity (RD) approach to identify retirement in the hours equations. This approach has several advantages that have been carefully discussed by, for example, David Lee and Thomas Lemieux (2010), Wilbert van der Klaauw (2008), and Guido Imbens and Thomas Lemieux (2007). Essentially, because individuals close to the discontinuity cut-off (age 60 in our case) and situated on the two sides of the age cut-off are likely to be very similar, a regression discontinuity design is very close to an experimental design and requires fewer assumptions than, for example, other techniques such as differences-in-differences, which rely on finding a control group similar to the treatment group.

Under an RD design, to estimate the effect of individual retirement, R (the binary treatment) on hours of work, H (the outcome variable), we would specify retirement as a function of

[3]See, for example, Blanchet, Didier and Louis-Paul Pele (1997) or Bozio, Antoine (2004) for details of the French pension system. In 2010, legal early retirement age was set at 62 years, with effect, however, only as from 2018. Jean-Olivier Hairault, Francois Langot and Thepthida Sopraseuth (2010) model the employment effect of the distance to legal retirement age in France, within a theoretical job search framework, to conclude that increasing legal retirement age is likely to increase employment rates of older workers.

[4]Other policies are targeted at older unemployed workers, aged 55 and above, that are allowed not to search for jobs ("dispenses the recherches d'emploi") or at employers, that have to pay some large penalty to be able to fire older workers, aged above 55 ("Contribution Delalande"). See Bommier, Roger and Magnac (2003) for an analysis of both policies and their effects on French labour market dynamics. Here we restrict the sample for analysis to dual-earner couples (see Section 3).

age, $R_i = f(age_i)$, assuming that $f(age_i)$ is continuous on the two sides of the discontinuity at the legal early retirement age (60 years for most workers in France today) and that individuals cannot manipulate their age. Under a so-called "sharp" RD design, everyone would retire when they reach age 60 -the jump in the retirement probability at age 60 would be equal to one. However, in practice some individuals may retire earlier, due to special sector-of-employment (early) retirement plans, and others may retire later, because they may not have accumulated enough pension contributions by the time they reach age 60 to be able to obtain maximum (full) pension benefits[5] –and thus they will continue to work a few extra years past age 60 to retire later with larger pension benefits. To account for this, we use a Fuzzy Regression Discontinuity (FRD) design (see Jinyong Hahn, Petra Todd and Wilbert van der Klaauw, 2001, for more details of this approach) that allows for a jump greater than zero but less than one in the probability of retirement at the age cut-off of 60 years. The FRD design has also been used in the literature as an alternative to a sharp RD approach when there are variables that may affect the treatment (retirement here) but are not observed by the researcher.[6]

Under a FRD setup, the causal effect of retirement on hours is given by the following expression (see Jinyong Hahn, Petra Todd and Wilbert van der Klaauw, 2001, for proofs):

$$1) \qquad \iota = \frac{H^+ - H^-}{R^+ - R^-}$$

where $H^+ = \lim_{age \to 60^+} E[H_i | age_i = 60]$ and $H^+ = \lim_{age \to 60^-} E[H_i | age_i = 60]$ and the two limits $R^+ = \lim_{age \to 60^+} E[R_i | age_i = 60]$ and $R^+ = \lim_{age \to 60^-} E[R_i | age_i = 60]$ exist. The denominator is greater than zero and less than one, and the function $R_i = f(age_i)$ is smooth on the two sides of the discontinuity. To estimate the effect of individual retirement on hours, given by ι above, one can use an instrumental variable approach , namely two-stage least squares (see, Jinyong Hahn, Petra Todd and Wilbert van der Klaauw, for a proof; and

[5] The pension benefits payable reach a maximum when individuals have cumulated a given contribution record (for example, 40 years of contributions in 1994 for people born in 1944 and working in the private sector). Once individuals have contributed enough to retire with maximum (full) pension benefits, their pension benefits will not increase if they retire later. Furthermore, periods of unemployment or sick leave, including maternity and parental leave, all lead to full (100 per cent coverage of) pension contribution records.

[6] This is the case here for the contribution period and household income that are not collected in the French LFS. Notice, however, that individuals can control their contribution period by increasing or reducing work effort, so that this variable is likely to be endogenous. Moreover, income is likely to drop at retirement while in the RD design covariates are required to vary smoothly on the two sides of the discontinuity. Therefore, we are confident about excluding these variables from the FRD model.

for example, David Card, Carlos Dobkin, and Nicole Maestas (2009), or Battistini, et al. 2009, for some applications).

Let us then specify an equation for hours as follows:

2) $H_i = \alpha + R_i \iota + Z_i \beta^i + \upsilon_i$

Jinyong Hahn, Petra Todd and Wilbert van der Klaauw (2001) show that the error term in this equation does not have to be uncorrelated with age for identification purposes.

The first stage equation takes the following form:

3) $R_i = D_i \gamma^{ri} + Age_i D_i \eta^{ri} + Age_i (1-D_i) \pi^{ri} + Z_i \beta^{ri} + \nu^{ri}$

where the dummy D_i takes value one when the individual has reached age 60 and zero otherwise, Age_i is a flexible polynomial in age (in the empirical specification, we use quartic polynomials in age of partners, thus n equals 4), and the vector Z_i other contains individual characteristics. The literature also uses, alternatively, the following expression for the first-stage equation, which results in the same value for the coefficient on D, although it does not allow explicitly for age polynomials on the two sides of the discontinuity:

3a) $R_i = D_i \gamma^{ri} + Age_i \Upsilon^{ri} + Z_i \beta^{ri+} \nu^{ri}$

Combing equations 2 and 3, the reduced form equation for the effect of retirement on hours outcomes is:

4) $H_i = \alpha + D_i \gamma^{hi} + Age_i D_i \eta^{hi} + Age_i (1-D_i) \pi^{hi} + Z_i \beta^{hi} + \nu^{hi}$

and $\iota^{IV} = \frac{\gamma^{hi}}{\gamma^{ri}}$

where ι can be estimated using two-stage least squares, instrumenting R with D, and correcting the standard errors, as in Jinyong Hahn, Petra Todd and Wilbert van der Klaauw (2001).

Allowing both spouses' retirement to affect hours, equation 4 becomes:

5) $H_i = \alpha + D_m \gamma^{hm} + Age_m D_m \eta^{hm} + Age_m (1-D_m) \pi^{hm} + Z_m \beta^{hm} + D_f \gamma^{hf} + Age_f D_f \eta^{hf} + Age_f (1-D_f) \pi^{hf} + Z_f \beta^{hf} + \nu^{hi}$

where m stands for husband and f for wife, and i takes also value m or f, as we estimate this equation separately for hours of the husband and hours of the wife. The causal effect of retirement on spouses' hours is then given, respectively by:

$$6) \quad \iota^{IV\,m} = \frac{\gamma^{\mathrm{hm}}}{\gamma^{\mathrm{rm}}} \quad , \quad \iota^{IV\,f} = \frac{\gamma^{\mathrm{hf}}}{\gamma^{\mathrm{rf}}}$$

Because spouses are on average two years apart, we can identify both spouses' retirement in the hours regression.

Furthermore, we control for the reform introduced in 1993 that required younger cohorts of individuals, born after 1933, to contribute between one and ten extra quarters to the pension fund (depending on the year of birth) to be able to obtain maximum (full) pension benefits upon retirement. The 1993 reform also affected the amount of full pension benefits payable, by making this last a function of the best 25 years[7] of wages instead of the best ten years of wages, which was the rule before 1993, as well as by linking the benefits payable to the inflation rate instead of the wage growth rate. We model the 1993 reform using a differences-in-differences approach, by defining cohorts born after 1933 as the treatment group and cohorts born in 1933 and earlier as the control group. The policy years are 1994 and later years and the control years, 1993 and earlier years, as the policy was announced in July 1993 and implemented as from 1994. [8] The effect of the policy change on the retirement probability is captured by the interaction term between the treatment group dummy and the policy year dummy for each spouse, say "$P93_m$" for the husband and "$P93_f$" for the wife. The standard assumption for the validity of this approach is that there are no other policy changes that affect the control and the treatment group (in different directions) during this period of time.

The 1993 policy (by increasing the length of the pension contribution period required to obtain full pension benefits) is likely to have reduced the incentive to retire at the legal early retirement age. Here we allow the 1993 policy change to affect spouses' retirement probabilities by including in our model full interactions of the "$P93_m$" and "$P93_f$" terms with all the D_m and all the D_f terms –and we also include in the equations controls for birth cohorts

[7] This reform was implemented gradually, so that these would be the best 11 years for individuals born in 1934 and the best 25 years for those born in 1944 (see Bozio, 2004, for more details).

[8] The data collection took place for each of the LFS surveys that we use here between January and May of the relevant year, with over 95 percent of the data being collected in March. In 1993, over 99 percent of the interview took place in March.

and years (see Table A in the Appendix for full set of results). Then, Equation 5 above becomes:

$$7)\ H_i = \alpha + D_m \gamma^{lm} + Age_m D_m \eta^{lm} + Age_m (1-D_m) \pi^{lm} + D_m\ P93_m \gamma^{p93m} + Age_m D_m P93_m \eta^{p93m} + Age_m (1-D_m) P93_m \pi^{p93m} + Z_m \beta^{hm} + treat_m \beta^{tm} + D_f \gamma^{lf} + Age_f D_f \eta^{lf} + Age_f (1-D_f) \pi^{lf} + D_f P93_f \gamma^{p93f} + Age_f D_f P93_f \eta^{p93f} + Age_f (1-D_f) P93_f \pi^{p93f} + Z_f \beta^{hf} + treat_f \beta^{tf} v^{hi}$$

and we estimate this equation separately for hours of the husband and hours of the wife. The causal effect of retirement on hours of spouses is given by:

$$8)\quad \iota^{IV\,m} = \frac{\gamma^{lm}}{\gamma^{rm}} + \frac{\gamma^{p93m}}{\gamma^{rm}} \quad , \quad \iota^{IV\,f} = \frac{\gamma^{lf}}{\gamma^{rf}} + \frac{\gamma^{p93f}}{\gamma^{rf}}.$$

3. The data

The data for the analysis are drawn from the French Labour Force Surveys (LFS) 1990-2002. We use this sample cut for a number of reasons. First of all, these yearly surveys are highly comparable over time as they use the same questionnaire, the same data collection method (personal interviews at the respondent's home) and the same sample design approach. The LFS series was broken in 2003 to comply with Eurostat requirements. The recent LFS series (as from 2003) are carried out quarterly and most of them are done by telephone; and the questionnaire and the sample design have changed dramatically relative to the earlier 1990-2002 surveys. In addition, another reform of the length of the pension contribution period took place in 2003, exactly at the time of the break in the LFS series.

Therefore, we select a sample of couples from the 1990-2002 yearly LFS as follows:

- Individuals were matched to their partner if any
- Single people were dropped from the sample
- Same sex couples were dropped from the sample
- Multi-couple households were also dropped
- Records from different survey years were pooled together.

This gave a sample of 588 654 couples. We selected couples for the analysis as follows:

1. -Both partners were aged between 50 and 70 (see below for our measure of age), which gave a sample of 148 395 couples.

2. -Both were dual-earners or retirees (dropping other inactive partners, i.e. dropping 60127 couples)
3. -Couples were formally married (we dropped 2795 cohabitant couples).

This gave a final sample of 85 473 couples. To apply a regression discontinuity approach we use ten year bounds on the two sides of the discontinuity, at age 60, which is the legal early retirement age for most workers in France. We also test for the robustness of the results to selecting narrower bandwidths on the two sides of the age discontinuity.

The LFS collects month and year of birth together with records of the day, month and year of the interview. Therefore, we construct a continuous measure of age on the day of the interview. Retirement status is measured on the interview date. We exploit two different measures of hours based on the following two questions:

- ✓ Usual weekly hours of work
- ✓ Actual hours of work in the past week

Education refers to completed years of education. The reference category includes individuals with only an elementary education. As mentioned before, individuals with higher levels of education are likely to enter the labour market later and thus to postpone retirement.

The number of children comprises children younger than 18 years at the time of the survey. This variable may affect retirement as individuals with younger children are probably less likely to retire since retirement induces a drop in income (pension benefits are smaller than earnings). Besides, the presence of relatively young children may also affect work hours.

The most disaggregated area of residence available in the survey is the department. France is divided into 22 regions that are further subdivided into 95 departments - without considering the overseas territories (French Guyana, Guadeloupe, Martinique, Mayotte, Ile de la Reunion) that were not covered by these surveys. The level of the unemployment rate may affect the individual retirement probability as, for example, employers may encourage older workers to retire in recessionary times. Therefore, we construct a measure of the local unemployment rate, using the level of the departmental unemployment rate in the year before each survey was carried out –which gives 95 department *13 survey values for the local unemployment rate.

We also include year dummies in all the regressions of the model to capture macroeconomic changes like the secular increase in female labour supply. Year and cohort dummies also serve as controls for the differences-in-differences specification.

Finally, the survey provides information on the day of the month the survey was carried out. Firms typically have to satisfy orders by a certain day of the month. Therefore, the day of the month is likely to affect hours and we include it in the regressions. Because over 95 per cent (and over 99 percent in some years) of the LFS interviews were carried out in March of each year, we do not use the month of the survey.

4. Descriptive statistics and exploratory analysis

Descriptive statistics of the main sample for analysis, including married couples who are dual-earner or retirees, with both spouses aged 50 to 70 years, are provided in Table 1.[10] The wife is on average 2 years younger than the husband. About 60 percent of married men and 48 percent of married women in our sample are aged 60 or above. Half of our sample have an elementary school diploma, which is the reference category for the education dummies in the econometric model. About 30 percent of the men and 27 percent of the women have only completed middle school; while about 6 percent of the men and 8.5 percent of the women have only a high school diploma. The proportion of college graduates is slightly larger for men, (10 percent) than for women (8 percent). We know that the proportion of college graduates increases over time and does so faster for women than for men, so that in recent years this pattern is reversed (we control for year dummies in the regressions). About 97 percent of the spouses had a French nationality. The average number of children younger than 18 years is 0.30 (remember the couples in the sample are aged between 50 and 70 years). The local unemployment rate was equal to 9 percent on average. As mentioned before (see Section 3), there is a lot of variation in the unemployment rate, which is allowed to vary over the 95 French departments and over the thirteen years covered by the sample. Finally, about 63 percent of men and 50 percent of women had retired from work. According to the definition of hours used (usual weekly hours or hours of work in the past week, see Section 3) the average of usual (past-week) hours, for those still working was 42 (40) for men and 34 (31) for women. The corresponding figures when also averaging in instances of zero hours were, respectively, 12 (15) hours for men and 14 (15) hours for women.

[10] Descriptive statistics for the sample including all inactive partners aged 50 to 70 years are provided in Table B of the Appendix to the paper.

Table 2 provides descriptive statistics of the Z variables in our model (see Section 2) for compliers (retirees) and non-compliers (employed persons) on the two sides of the discontinuity (below and above age 60).[11] As anticipated (see Section 2), college educated spouses are less likely to retire at early retirement age. The number of dependent children also correlates negatively with retiring early. As a test that the covariates included in the instrumental variable model (the Z) are not discontinuous at age 60 we also plots the predicted retirement probability including only the Z among the regressors (see later).

To graphically explore the discontinuity in spouses' retirement at the legal early retirement age, as is usually done in the RD literature, we plot the retirement probability against age on the two sides of the age cut-off, using bins of ten month size, as is usually done in the RD literature (see top panels of Charts 1). We find very large jumps in spouses' retirement as a function of own age.[13]

We also explore graphically the continuity of the other covariates–the Z vector in the notation of Section 2- by plotting the age profile of the predicted retirement probability, estimated including only the Z covariates among the regressors (see bottom panels of Charts 1). On the basis of this evidence, we can conclude that the Z variables are indeed continuous at age 60.

Non-parametric evidence on the behaviour of the retirement probability on the two sides of the age cut-off point is also gathered in Charts 2, where the probability of retirement is estimated as a function of smoothed local polynomials in age on the two-sides of the age cut-off. We repeat the analysis for own age ((left-hand charts in Charts 2) and spouse's age (right-hand charts in Charts 2), by letting the retirement probability vary, respectively, as a function of own-age polynomials (left-hand charts) or, alternatively, spouse's age polynomials (right-hand charts). We also plot 95 confidence bounds around each curve – notice that given the large sample size the confidence bounds basically coincide with the predicted probability curves. We find large jumps in the own retirement probability upon reaching age 60. We also observe small jumps in the husband's retirement probability when the wife reaches age 60; and, vice-versa, in the wife's retirement probability when the husband reaches age 60.

[11] Table C in the Appendix to the paper provides similar statistics for the sample including also inactive spouses (see also Section 3).

[13] The raw age distribution of married men and married women in our sample, excluding or including inactive spouses, is plotted in Charts 1 in the Appendix.

Charts 3 (and Charts 4) provide similar information for usual week hours (past-week hours of work). Hours drop dramatically for both spouses at the legal early retirement age cut-off. We also detect a small drop in the hours of the husband when the wife is aged 720 months or more; and, vice-versa, we see a small drop in her hours when he is aged 720 months or more. The 95 confidence bounds are very close to the predicted probability curves and never cross, thus suggesting that the cross effects are statistically significant for both spouses.

Finally, we discuss some exploratory analysis of the changes in the retirement probability of spouses following the 1993 policy change, which essentially required younger cohorts born after 1933 to pay longer pension contribution periods to be able to receive maximum (full) pension benefits upon retirement (see Section 2). The policy change was voted in the summer of 1993 and it came into force in 1994. The LFS surveys 1990-2002 were carried between January and May of each year, and over 95 percent of these yearly interviews were carried out in the month of March –in particular, in 1993, over 99 percent of the respondents were interviewed in March. Therefore, we assume that 1994 and later years are "policy" year, and 1990 to 1993 are "control" years (see Section 2). Because the policy hit younger cohorts, spouses in the treatment group are on average more educated and have more children than those in the control group (see Table D in the Appendix). However, one can reasonably assume that in the absence of the 1993 reform, the retirement probabilities of the spouses in the two groups would have evolved in a comparable manner[14].

According to the raw estimates of the retirement effect of the 1993 policy change, respectively, for husbands and wives, in the policy year, 1994, over the first three years of implementation of the policy, 1994-1996, and over all of the policy years included in our sample, 1994-2002 (see Table E in the Appendix), the effect of the 1993 policy change on the retirement probability of both spouses was small, negative and decreasing over time. The probit (marginal) estimates, including among the covariates education and nationality dummies, the number of children and the local unemployment rate, indicate an average reduction on the retirement probability of 0.039 for married men and between 0.027 and 0.045 for married women (see Table F in the Appendix). The raw estimates of the cross retirement effect of the 1993 policy change, i.e. the effect on the retirement probability of the husband if the wife was affected by the policy change; and vice-versa, the effect on the retirement probability of the wife if the husband was affected by the policy change are

[14] Other age-targeted policies were addressed to the unemployed that are not included in our sample.

significantly negative though quite small for married women; while they are not always significant for married men (see Table G in the Appendix).

To conclude, the descriptive evidence gathered confirms earlier findings (see Bozio, 2004) that the 1993 policy change delayed retirement of individuals. In particular, we expect that this policy change reduced the chances to retire at the legal early retirement age for the spouses hit by the policy. Therefore, we combine (interact) in our econometric model controls for the discontinuity at the legal early retirement age with controls for the effect of the 1993 policy change (see Section 2 and Table A in the Appendix for full results).

5. Estimation Results

First of all, we provide results of estimation of first stage regressions of spouses' retirement. Next, the results of estimation of the instrumental variable models are presented (see Section 2).

Table 3 presents the results of estimation of 'first stage' models of the retirement probability of the two spouses, including and excluding controls for the 1993 policy change (see Section 2) or other covariates. The full set of estimates is provided in Table A of the Appendix, where it is shown that many of the interaction terms with the age polynomials are significant, suggesting that the fuzzy approach is indeed the right one in this context.

The first block of results in Table 3 (specification 1) indicates that the own retirement probability increases significantly upon reaching age 60, on average by 0.23 (0.27 minus 0.04) for the husband and 0.28 for the wife. This represents an increase in the retirement probability at the discontinuity of 51 per cent for married men and 64 per cent for married women. [15] The size of these estimates is robust to including or excluding covariates. Dropping the 1993 policy terms, the estimates are slightly larger and equal, respectively, to 0.25 for man and 0.29 for women. Narrowing the size of the sample on the two sides of the discontinuity (to couples with both spouses aged between 56 and 64), the estimates get smaller and equal, respectively, to 0.21 for men and 0.19 for women (see specification 2 in Table 3). Restricting the sample to the pre- policy 1993 reform years (specification 3 in Table 3), the estimates are a little larger, and equal, respectively, to 0.29 for married men and 0.30 for married women. While considering only the post-policy 1993 years (specification 4 of

[15] The mean of retirement for couples with spouses aged 59 to less than 60 is, respectively, 0.45 for married men and 042 for married women, in our sample.

Table 3), the increase in the retirement probability upon reaching age 60 is about 0.24 for married men and 0.28 for married women, which is very close to our main specification (as the data cover more post- policy years than pre -policy years). Therefore, this last set of results confirms that the 1993 policy reduced the size of the jump in the retirement probability at the legal early retirement age, and especially so for men. In particular, we find that the 1993 reform reduces the probability to retire at age 60 by 0.04 for married men, though this effect is only significant at the ten per cent level (see specification 1 in Table 3) while the effect is not significant for married women. However, many of the coefficients on the interaction terms of the 1993 policy with the age polynomials are significant (see Table A), suggesting that the 1993 policy reform affected the wife's retirement probability although it did not change her probability to retire at the early retirement age. In contrast, the estimated effect for married men is very close to that obtained for the retirement probability of the population of married men in the LFS sample, which is equal to 0.039 (see Table F in the Appendix, and Section 4 for more details), suggesting perhaps that most of the effect of the 1993 reform for men was to reduce the propensity to retire at early retirement age.

Coming to the cross effects (the effect of the spouse being aged at least 60 on the own retirement probability), the retirement probability of the husband increases significantly when the wife reaches the legal early retirement age, according to our main specification (specification 1 of Table 3), though the increase is only weakly significant and quite small in size, equal to 0.03. In particular, the cross effect of her being aged at least 60 on his retirement probability is robust to dropping the 1993 policy terms from our specification. However, splitting the sample into pre and post policy years, we find that this cross effect was a little larger and equal to 0.04 in the pre-policy period while in the post-policy years it is no longer significant. The effect becomes also insignificant when dropping covariates or narrowing the sample size. Her retirement probability on the other hand does not increase when he reaches legal retirement age. This is perhaps because the average wife in the sample is two years younger than the husband.

More robustness checks are shown in Table 4. In specification 5, we included only controls for the own (husband's or wife's) characteristics and age. The estimates of the effect of reaching age 60 on the own retirement probability are very close to those of our main specification for the first stage regression, and equal, respectively, to about 0.27 for either partner. The interaction effect of the 1993 policy change with the age-60–and- above dummy is very close in size to our main specification but not statistically significant.

Next, we experimented with selecting a subsample of couples with the wife being at least two years older than the husband (specification 6 of Table 4). For this sample, the estimated increase in the retirement probability of the husband upon reaching age 60 is much smaller than in our main specification and equal to 0.12, suggesting that when the wife is presumably the first to retire, the husband has a smaller incentive to retire at the early retirement age - relative to situations where he is the first to retire (the average husband in our main sample is two years older than the wife). As far as the wife, her probability to retire at the early retirement age is a little larger than for the main sample and equal to 0.31. The cross effect of her reaching age 60 on his retirement probability becomes now statistically insignificant - while the cross effect of his reaching age 60 on her retirement probability stays not significant.

In contrast, in specification 7 (Table 4), we selected a larger sample of couples than our main sample now including other inactive spouses, such as the unemployed, the disabled, or housewives. For this sample, the probability to retire at the legal retirement age increases by 0.28 (0.33 minus 0.05) for men and by 0.09 for women. The probability to retire at the early retirement age for women is very small, probably due to having included so many housewives in the sample. The 1993 policy interaction term with the age-60-and-above dummy is strongly significant and negative for men while it is negative but not significant for women. None of the cross retirement effects are significant when including other inactive spouses in the sample.

Finally, results of estimation of the reduced form hours equations are given in Table 5. We alternatively use two definitions of hours: usual week hours of work and actual hours of work in the past week. For either definition, we show a selected set of estimates for our main sample and for the subsample of couples with both spouses aged 56 to 64. We find dramatically large drops in own hours upon retirement for both spouses: the estimated size of the reduction in own hours upon own retirement is in the range of 65 to 77%. In particular, the reduction in own usual week hours upon own retirement is equal to 77% for both spouses. The cross effect of a spouse's retirement on own hours is strongly significant, though small in size, varying between 2 and 5 per cent depending on the definition of hours adopted and the sample cut. For usual hours and for the main sample, his hours drop by less than 2 per cent upon her retirement, and her hours drop by 5.5 per cent upon his retirement (see specification 1 of Table 5). Narrowing the sample size on the two sides of the discontinuity to spouses aged 56 to 64 years (specification 2 of Table 5), the effects are comparable in terms

of significance and size. In particular, his past week hours fall by 2 per cent when she retires and her past week hours fall by 4 per cent upon his retirement. The estimates of the effect of own and cross retirement on spouses' actual hours of work in the past week ((specification 3 of Table 5), are also very similar. His past-week hours fall by 76 per cent upon his retirement and her past-week hours fall by 69% upon her retirement. If she retires, his past-week hours fall by 4 per cent and if he retires, her past-week hours fall by 3 per cent. These effects are robust to narrowing the sample size on the two sides of the age 60 cut-off (see specification 4 of Table 5).

A number of further robustness checks were carried out. In Table 6, we provide similar estimates for the specification without controls for the 1993 policy change. The estimates of the own and cross retirement effects on hours are very close to those of our main specification. Table 7 provides comparable estimates for the subsample of couples with the wife at least two years older than the husband. For this subsample, the cross effect of her retirement on his hours is much larger than for the main sample, and equal, respectively, to 7 per cent for usual hours, and to 8 per cent for past week hours; while the cross effect of his retirement on her hours is smaller (and not significant for usual hours). Finally, in Table 8, we present similar estimates for the larger sample, including other inactive spouses. For this larger sample, the effect of effect of her retirement on her hours is smaller, while that of his retirement on his hours is larger in relative terms. The cross effect of his retirement on her hours is larger, while that of her retirement on his hours is smaller than for our main specification.

Conclusions

The objective of this study is to estimate the causal effect of spouses' retirement on spouses' hours of work. We exploit legal early retirement age in France and use a regression discontinuity approach, to identify the spouses' retirement in our model.

The model is estimated with data on over 85 000 dual-earner couples with spouses aged 50 to 70. Exploratory graphical analysis indicates very large jumps in the own retirement probability at the legal early retirement age for both spouses. The retirement probability also jumps up when the partner reaches age 60 (cross effects), though these cross effects are much smaller than the own effects. Own hours are found to fall dramatically with own retirement

and to decrease further with spousal retirement –suggesting negative cross effects of a partner's retirement on own hours.

Parametric estimation confirms these findings. We find evidence of large and significant jumps in the own retirement probability at the legal early retirement age for both men and women in a couple. The 1993 reform, which increased the length of the pension contribution period, slightly reduced the probability to retire at the early retirement age for married men but not for married women. The husband's retirement probability increases slightly when the wife reaches early retirement age, while her retirement probability is not responsive to his early retirement age. Selecting a subsample of couples where the wife is at least two years older than the husband (the average wife in the sample is two years younger than the husband), the cross effect of her reaching age 60 on his retirement probability becomes now statistically insignificant -while the cross effect of his reaching age 60 on her retirement probability stays not significant.

These asymmetries in joint retirement strategies of spouses are in line with the conclusions of recent literature for the United States. Moreover, when spouses can join (private) pension plans together they may have stronger incentives to time their retirement closely than under a system of separate (public) pension schemes such as the French one. However, the man and the woman in a couple may opt for reducing hours rather than fully retire from work when their spouse retires. Here we conclude indeed that hours fall significantly upon own and partner's retirement for both spouses. The own effect is dramatically large and equal to a drop in hours of work in the range of 65 to 77 per cent at age 60 and above. In contrast, the cross effects are small, though strongly significant, suggesting an average reduction of one or two hours per week upon spousal retirement. To conclude, the evidence gathered in this study suggests that both the man and the woman in a couple reduce significantly their working hours when their spouse retires but this effect is small.

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Table 1.	Sample descriptive			
	Husband		Wife	
	Mean	Standard dev.	Mean	Standard dev.
Age	61.233	5.467	59.279	5.526
Age 60 and above	0.597	0.490	0.476	0.499
Elementary School	0.523	0.499	0.564	0.495
Middle School	0.298	0.457	0.266	0.442
High School	0.066	0.249	0.085	0.279
College	0.109	0.312	0.081	0.274
French	0.971	0.166	0.978	0.146
Retired	0.635	0.481	0.508	0.499
Usual week Hours >0	42.18	12.861	33.90	13.72
Past week Hours (if usual week hours >0)	40.08	18.39	30.87	17.74
Usual week Hours	12.34	20.42	14.36	18.98
Past week hours	14.95	22.40	15.08	19.80
	Couple's characteristics			
		Mean	Standard dev.	
Children number		0.325	0.652	
Local U rate		9.222	2.36	
Observations no.	*85473*			

Note: The sample includes dual-earner or retiree married couples with both spouses aged 50 to 70 (extremes included).
The local U rate is the year (t-1) unemployment rate at the department level (there are 95 departments). U rate varies across departments and over the 13 LFS years.

Table 2. Sample descriptives by retirement status on the two sides of the age cut-off

	Men in a Couple			
	Not Retired Age 50-59	Retired Age 50-59	Not Retired Age 60-70	Retired Age 60-70
Elementary School	0.366	0.463	0.445	0.628
	(0.481)	(0.498)	(0.497)	(0.483)
Middle School	0.382	.0376	0.193	0.245
	(0.485)	(0.484)	(0.395)	(0.430)
High School	0.083	0.077	0.082	0.054
	(0.277)	(0.267)	(0.275)	(0.226)
College	0165	0.082	0.276	0.070
	(0.371)	(0.274)	(0.276)	(0.255)
French	0.963	0.979	0.947	0.976
	(0.187)	(0.143)	(0.222)	(0.151)
Children number	0.588	0.323	0.353	0.170
	(0.813)	(0.624)	(0.669)	(0.474)
Local U rate	9.107	9.263	9.128	9.290
	(2.350)	(2.367)	(2.336)	(2.365)
Observations no.	28334	*6053*	*2829*	*48257*
	Women in a Couple			
	Not Retired Age 50-59	Retired Age 50-59	Not Retired Age 60-70	Retired Age 60-70
Elementary School	0.479	0.421	0.654	0.667
	(0.499)	(0.493)	(0.475)	(0.470)
Middle School	0.309	0.302	0.188	0.224
	(0.462)	(0.459)	(0.391)	(0.417)
High School	0.101	0.135	0.072	0.062
	(0.301)	(0.342)	(0.259)	(0.241)
College	0.108	0.140	0.081	0.044
	(0.311)	(.347)	(0.273)	(0.205)
French	0.969	0.983	0.961	0.987
	(0.171)	(0.127)	(0.193)	0.111)
Children number	0.537	0.272	0.238	0.124
	(0.788)	(0.601)	(0.548)	(0.397)
Local U rate	9.114	9.223	9.296	9.326
	(2.338)	(2.391)	(2.359)	(2.373)
Observations no.	*38319*	*6392*	*3653*	*37109*

Note: The sample includes dual-earner and retiree spouses aged 50 to 70.
The total sample size is 85473 observations.

Chart 1. Discontinuities at age 60 in retirement and covariates other than age.

Means of retirement and means of predicted retirement as a function of covariates other than age.

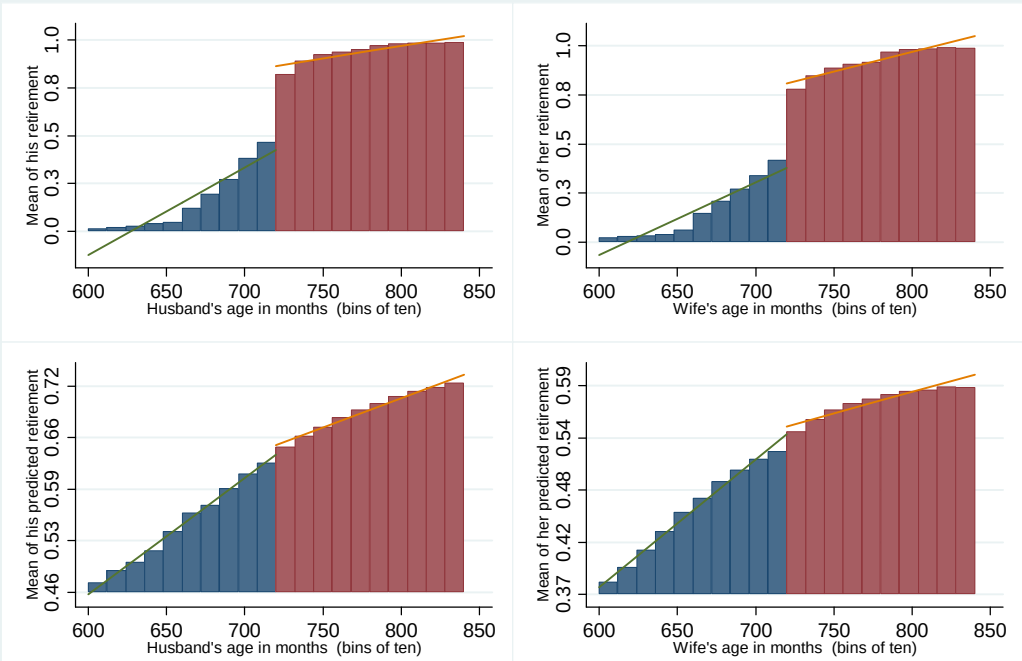

Chart 2. Spouses' retirement as a function of own and spouse's age

Smoothed polynomials from the left and the right of the age cutoff (720 months)

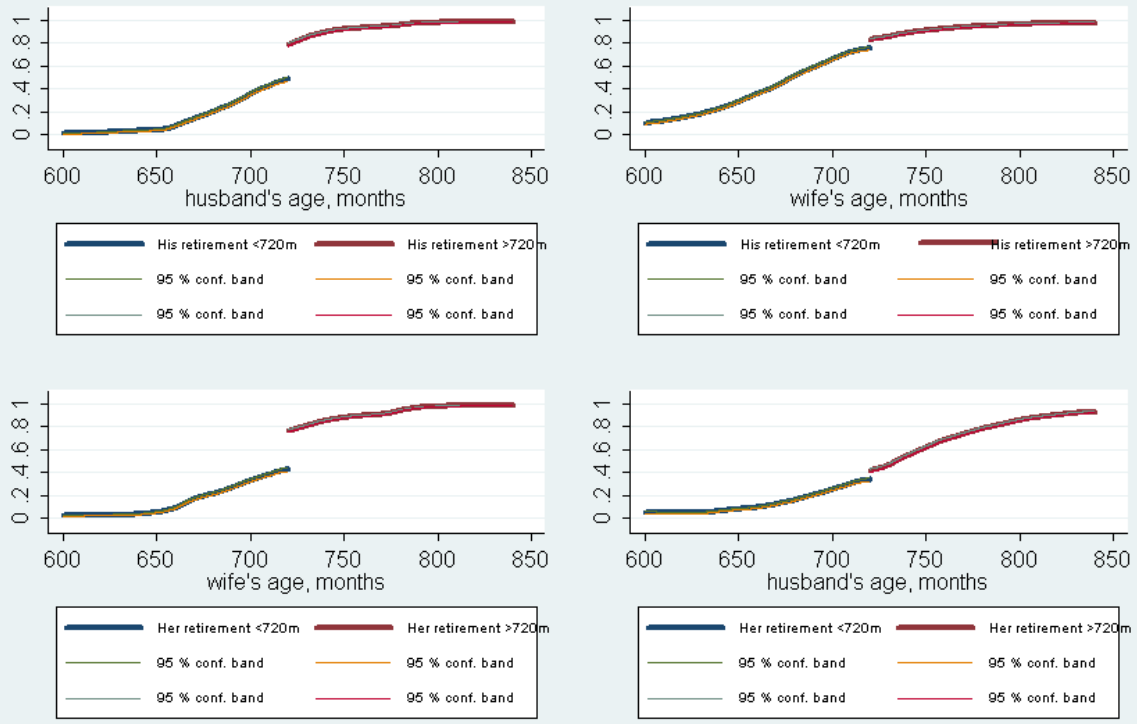

Chart 3. Spouses' hours as a function of own and spouse's age

Smoothed local polynomials from the left and the right of the age discontinuity

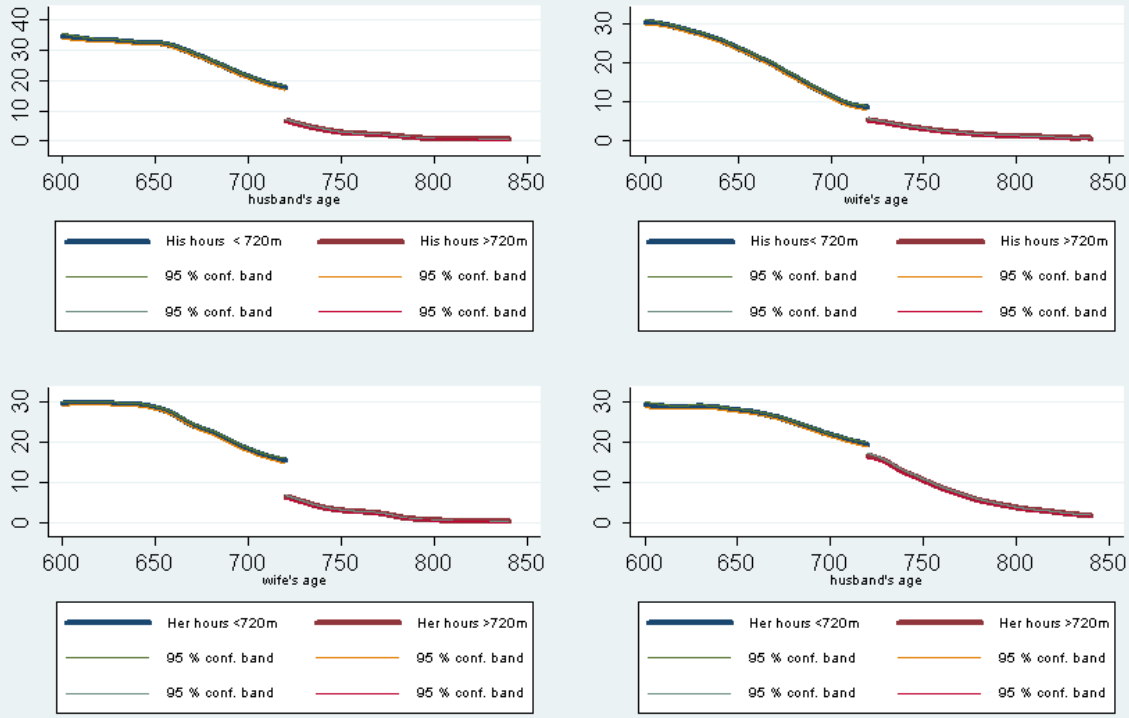

Chart 4. Partners'hours last week as a function of own and partner's age

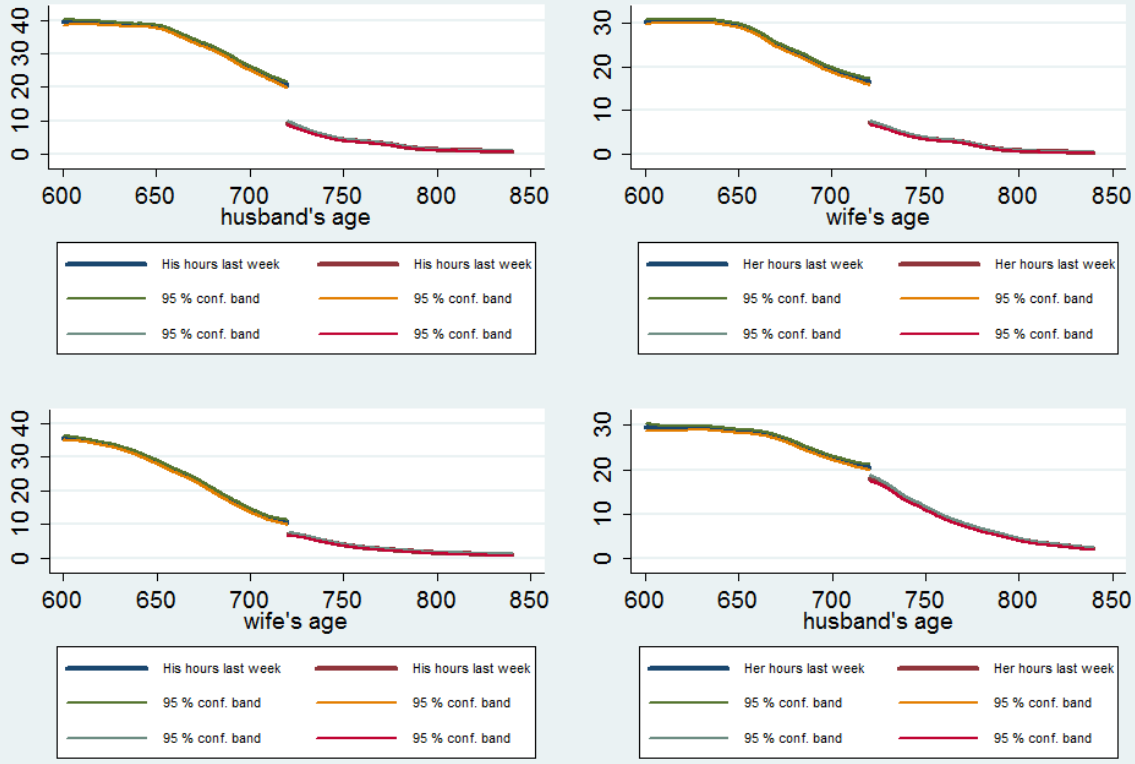

Table 3. Linear Retirement Probability: first stage regressions

1) Dual-earner or retiree spouses aged 50 to 70 included. Couples 85473.

	He Retires	She Retires	He Retires	She Retires	He Retires	She Retires
He Age 60 and above= Dm	0.273***	-0.0115	0.270***	-0.0132	0.254***	0.00120
	(0.0209)	(0.0179)	(0.0210)	(0.0180)	(0.0148)	(0.0124)
She Age 60 and above=Df	0.0276*	0.277***	0.0249	0.277***	0.0209**	0.289***
	(0.0154)	(0.0214)	(0.0155)	(0.0215)	(0.0103)	(0.0152)
P93* He Age 60 and above	-0.0421*	0.0215	-0.0407*	0.0236		
	(0.0238)	(0.0211)	(0.0240)	(0.0211)		
P93* She Age 60 and above	-0.0117	-0.00332	-0.00447	-0.00201		
	(0.0175)	(0.0248)	(0.0177)	(0.0247)		
Covariates (Z)	yes	yes	no	no	yes	yes

2) Dual-earner or retiree spouses aged 56 to 64 included. Couples 20836.

	He Retires	She Retires	He Retires	She Retires	He Retires	She Retires
He Age 60 and above= Dm	0.210***	0.00321				
	(0.0438)	(0.0404)				
She Age 60 and above=Df	0.0347	0.199***				
	(0.0340)	(0.0445)				
P93* He Age 60 and above	-0.0585	-0.00352				
	(0.0471)	(0.0455)				
P93* She Age 60 and above	-0.0145	-0.0124				
	(0.0371)	(0.0489)				
Covariates (Z)	yes	yes	no	no	yes	yes

3) Dual-earner or retiree spouses aged 50 to 70 included, years 1990 to 1993 included. Couples 24050.

	He Retires	She Retires	He Retires	She Retires	He Retires	She Retires
He Age 60 and above= Dm					0.294***	0.00190
					(0.0277)	(0.0227)
She Age 60 and above=Df					0.0451**	0.303***
					(0.0201)	(0.0278)
Covariates (Z)	yes	yes	no	no	yes	yes

4) Dual-earner or retiree spouses aged 50 to 70 included, years 1994 to 2002 included. Couples 61423.

	He Retires	She Retires	He Retires	She Retires	He Retires	She Retires
He Age 60 and above= Dm					0.238***	0.00200
					(0.0174)	(0.0147)
She Age 60 and above=Df					0.00978	0.282***
					(0.0120)	(0.0182)
Covariates (Z)	yes	yes	no	no	yes	yes

*** stands for statistical significance at the 1 per cent level; ** at the 5 per cent and * at the 10 per cent. The covariates included are spouses' French nationality and education dummies, number of children, local unemployment rate, year and cohort dummies.

Table 4. Linear Retirement Probability: first stage regressions

More specifications

5) Dual-earner or retiree with both spouses aged 50 to 70 included. Couples 85473.

Including only his (her) covariates and his (her) age variables among the regressors; not accounting for hers (his) covariates.

	He Retires	She Retires
He Age 60 and above= Dm	0.268***	
	(0.0209)	
She Age 60 and above=Df		0.276***
		(0.0215)
P93* He Age 60 and above	-0.0349	
	(0.0237)	
P93* She Age 60 and above		0.000857
		(0.0247)
Covariates (Z)	Yes	yes

6) Dual-earner or retiree with both spouses aged 50 to 70 and with the wife at least two years older than the husband. Couples 7977.

	He Retires	She Retires
He Age 60 and above= Dm	0.128*	-0.0348
	(0.0677)	(0.0545)
She Age 60 and above=Df	0.0632	0.311***
	(0.0612)	(0.0743)
P93* He Age 60 and above	-0.000233	0.0820
	(0.0742)	(0.0587)
P93* She Age 60 and above	-0.0632	0.0735
	(0.0743)	(0.0852)
Covariates (Z)	Yes	Yes

7) Dual-earner or retiree or other inactive spouses aged 50 to 70 included. Couples 143982.

	He Retires	She Retires
He Age 60 and above= Dm	**0.330*** **	-0.00170
	(0.0149)	(0.0155)
She Age 60 and above=Df	**0.00366**	0.0897***
	(0.0117)	(0.0143)
P93* He Age 60 and above	**-0.0501*** **	0.0244
	(0.0175)	(0.0188)
P93* She Age 60 and above	**-0.00287**	-0.00368
	(0.0137)	(0.0168)
Covariates (Z)	Yes	Yes

*** stands for statistical significance at the 1 per cent level; ** at the 5 per cent and * at the 10 per cent. The covariates included are spouses' French nationality and education dummies, number of children, local unemployment rate, year and cohort dummies.

Table 5 . The effect of spouses'retirement on spouses' hours. Instrumental variable estimates (2SLS GMM estimates).

	His Usual Hours		**Her Usual Hours**	
1) Main sample	Coefficient estimate	Percentage change	Coefficient estimate	Percentage change
His Retirement	**-33.09*** **	**-77.11**	**-2.15*** **	**-5.5**
	(0.197)		(0.216)	
Her Retirement	**-0.74*** **	**-1.61**	**-28.20*** **	**-77.47**
	(0.151)		(0.185)	
Underindentification test	1.2e+04***		1.2e+04***	
Overidentification test	98.57***		256.58***	
Observations	*85473*		*85473*	
Mean for spouses aged 59 to < 60	*19.31*		*16.38*	
	His Usual Hours		**Her Usual Hours**	
2) Spouses aged 56-64 years	Coefficient estimate	Percentage change	Coefficient estimate	Percentage change
His Retirement	**-32.79*** **	**-76.41**	**-1.577*** **	**-4.04**
	(0.443)		(0.408)	
Her Retirement	**-0.888** **	**-1.93**	**-27.381*** **	**-75.22**
	(0.322)		(0.330)	
Underindentification test	3421.29***		3421.29***	
Overidentification test	52.894***		165.50	
Observations	*20836*		*20836*	
	His Past Week Hours		**Her Past Week Hours**	
3) Main sample	Coefficient estimate	Percentage change	Coefficient estimate	Percentage change
His Retirement	**-37.019*** **	**-75.48**	**-1.285*** **	**-3.17**
	(0.189)		(0.222)	
Her Retirement	**-2.119*** **	**-4.03**	**-29.808*** **	**-68.67**
	(0.149)		(0.189)	
Underindentification test	1.2e+04***		1.2e+04***	
Overidentification test	99.65***		149.024***	
Observations	*85473*		*85473*	
Mean for spouses aged 59 to < 60	*22.07*		*18.23*	
	His Past Week Hours		**Her Past Week Hours**	
(4) Spouses aged 56-64 years	Coefficient estimate	Percentage change	Coefficient estimate	Percentage change
His Retirement	**-36.39*** **	**-68.08**	**-1.022** **	**-2.52**
	(0.421)		(0.421)	
Her Retirement	**-2.28*** **	**-4.33**	**-28.508*** **	**-65.68**
	(0.305)		(0.340)	
Underindentification test	3421.29***		3421.293***	
Overidentification test	165.50***		37.721***	
Observations	*20836*		*20836*	

Note: Standard errors are provided in brackets. Percentage changes are calculated at the discontinuity, as the percentage change in hours relative to the mean hours and retirement of the group aged 59 to less than 60, as customary in RD applications. The mean of retirement for the sample of couples with both partners aged 59 to less than 60 is, respectively, 0.45 for married men and 0.42 for married women. These models include the same covariates as in our preferred specification (see Table) unless otherwise specified. Only the effects of retirement on hours are shown here for conciseness.

The under-identification test is a Kleibergen-Paap LM test while the over-identification test is a Hansen J statistic. According to either test all the models in Table are well identified.

*** stands for statistical significance at the 1 per cent level; ** at the 5 per cent and * at the 10 per cent

Table 6. The effect of spouses'retirement on spouses' hours. Instrumental variable estimates (2SLS GMM estimates)

Specification without accounting for the 1993 policy reform

	His Usual Hours		**Her Usual Hours**	
	Coefficient estimate	Percentage change	Coefficient estimate	Percentage change
His Retirement	**-33.114*** **	**-76.90**	**-2.150*** **	**-5.3**
	(0.199)		(0.217)	
Her Retirement	**-0.751*** **	**-1.42**	**-28.228*** **	**-74.0**
	(0.154)		(0.186)	
Underindentification test	1.2e+04		1.2e+04	
Overidentification test	69.11		219.113	
Observations	*85473*		*85473*	
	His Past Week Hours		**Her Past Week Hours**	
	Coefficient estimate	Percentage change	Coefficient estimate	Percentage change
His Retirement	**-36.943*** **	**-75.32**	**-1.26*** **	**-3.11**
	(0.191)		(0.223)	
Her Retirement	**-2.224*** **	**-4.23**	**-29.851*** **	**-68.77**
	(0.151)		(0.189)	
Underindentification test	1.2e+04		1.2e+04	
Overidentification test	57.955		100.015	
Observations	*85473*		*85473*	

Note: Standard errors are provided in brackets. Percentage changes are calculated at the discontinuity, as the percentage change in hours relative to the mean hours and retirement of the group aged 59 to less than 60, as customary in RD applications. These models include the same covariates as in our preferred specification (see Table) unless otherwise specified. Only the effects of retirement on hours are shown here for conciseness.

The under-identification test is a Kleibergen-Paap LM test while the over-identification test is a Hansen J statistic. According to either test all the models in Table are well identified.

*** stands for statistical significance at the 1 per cent level; ** at the 5 per cent and * at the 10 per cent

Table 7. The effect of spouses'retirement on spouses' hours. Instrumental variable estimates

	Sample of married couples including dual-earner, retiree, *and other inactive* spouses			
	His Usual Hours		**Her Usual Hours**	
	Coefficient estimate	Percentage change	Coefficient estimate	Percentage change
His Retirement	**-27.929*** **	**-82.44**	**-7.048*** **	**-38.12**
	(0.138)		(0.162)	
Her Retirement	**-0.328** **	**-0.45**	**-14.763*** **	**-37.0**
	(0.120)		(0.170)	
Underindentification test	2.2e+04***		2.2e+04***	
Overidentification test	927.352***		2117.72***	
Observations	*143982*		*143982*	
Mean for spouses aged 59 to < 60	*13.89*		*7.58*	
	His Past Week Hours		**Her Past Week Hours**	
	Coefficient estimate	Percentage change	Coefficient estimate	Percentage change
His Retirement	**-31.512*** **	**-75.78**	**-6.651*** **	**-32.77**
	(0.140)		(.169)	
Her Retirement	**-1.381*** **	**-1.54**	**-15.615*** **	**-35.66**
	(0.127)		(0.178)	
Underindentification test	2.2e+04***		2.2e+04***	
Overidentification test	1024.49***		1836.02***	
Observations	*143982*		*143982*	
Mean for spouses aged 59 to < 60	*17.05*		*8.32*	

Note: Standard errors are provided in brackets. Percentage changes are calculated at the discontinuity, as the percentage change in hours relative to the mean hours and retirement of the group aged 59 to less than 60, as customary in RD applications. The mean of retirement for the sample of couples with both partners aged 59 to less than 60 is, respectively, 0.41 for married men and 0.19 for married women (the mean of non-employment, which includes other inactive and retiree, is, respectively, 0.57 for married men, and 0.73 for married women). These models include the same covariates as in our preferred specification (see Table) unless otherwise specified. Only the effects of retirement on hours are shown here for conciseness.

The under-identificaction test is a Kleibergen-Paap LM test while the over-identification test is a Hansen J statistic. According to either test all the models in Table are well identified.

*** stands for statistical significance at the 1 per cent level; ** at the 5 per cent and * at the 10 per cent

Table 8. The effect of spouses' retirement on spouses' hours. Instrumental variable estimates

Sample of dual-earner and retiree married couples with the wife at least two years older than the husband

	His Usual Hours		**Her Usual Hours**	
	Coefficient estimate	Percentage change	Coefficient estimate	Percentage change
His Retirement	**-32.166*** **	**-74.96**	**-0.398**	**-1.02**
	(0.719)		(0.373)	
Her Retirement	**-3.088*** **	**-6.72**	**-29.071*** **	**-79.86**
	(0.990)		(0.631)	
Underindentification test	1163.805***		1163.805***	
Overidentification test	64.989**		51.94**	
Observations	*7977*		*7977*	
Mean for spouses aged 59 to < 60				

	His Past Week Hours		**Her Past Week Hours**	
	Coefficient estimate	Percentage change	Coefficient estimate	Percentage change
His Retirement	**-35.133*** **	**-71.63**	**-1.23*** **	**-3.03**
	(0.711)		(0.351)	
Her Retirement	**-4.19*** **	**-7.97**	**-28.731*** **	**-66.19**
	(0.939)		(0.638)	
Underindentification test	1163.805***		1163.805***	
Overidentification test	53.776**		55.089**	
Observations	*7977*		*7977*	
Mean for spouses aged 59 to < 60				

Note: Standard errors are provided in brackets. Percentage changes are calculated at the discontinuity, as the percentage change in hours relative to the mean hours and retirement of the group aged 59 to less than 60 for the main sample (since this subsample gets really too small for this subgroup). The mean of retirement for the sample of couples with both partners aged 59 to less than 60 (349 couples) is, respectively, 0.45 for married men and 0.42 for married women. These models include the same covariates as in our preferred specification (see Table) unless otherwise specified. Only the effects of retirement on hours are shown here for conciseness.

The under-identification test is a Kleibergen-Paap LM test while the over-identification test is a Hansen J statistic. According to either test all the models in Table are well identified.

*** stands for statistical significance at the 1 per cent level; ** at the 5 per cent and * at the 10 per cent

Appendix

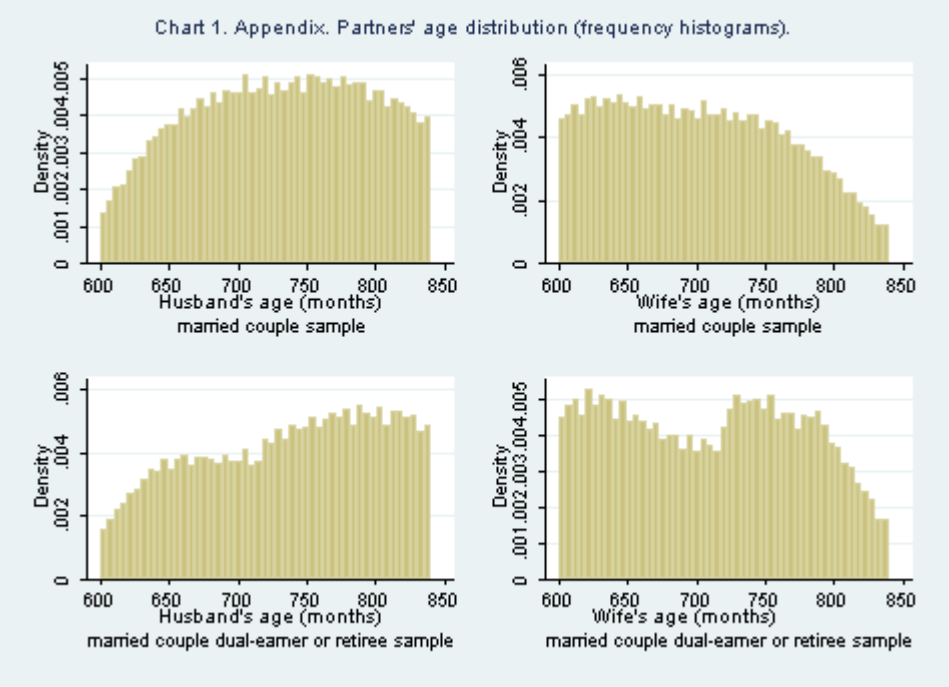
Chart 1. Appendix. Partners' age distribution (frequency histograms).
Density
0 .001 .002 .003 .004 .005
600 650 700 750 800 850
Husband's age (months)
married couple sample
Density
0 .002 .004 .006
600 650 700 750 800 850
Wife's age (months)
married couple sample
Density
0 .002 .004 .006
600 650 700 750 800 850
Husband's age (months)
married couple dual-earner or retiree sample
Density
0 .001 .002 .003 .004 .005
600 650 700 750 800 850
Wife's age (months)
married couple dual-earner or retiree sample

Table A. Appendix. Estimates of Linear Retirement Probability: first stage regressions

	His Retirement	Her Retirement	His Retirement	Her Retirement	His Retirement	Her Retirement
He Age 60 and above= Dm	**0.273*** **	**-0.0115**	**0.270*** **	**-0.0132**	**0.254*** **	**0.00120**
	(0.0209)	**(0.0179)**	**(0.0210)**	**(0.0180)**	**(0.0148)**	**(0.0124)**
She Age 60 and above=Df	**0.0276***	**0.277*** **	**0.0249**	**0.277*** **	**0.0209** **	**0.289*** **
	(0.0154)	**(0.0214)**	**(0.0155)**	**(0.0215)**	**(0.0103)**	**(0.0152)**
P93* He Age 60 and above	**-0.0421***	**0.0215**	**-0.0407***	**0.0236**		
	(0.0238)	**(0.0211)**	**(0.0240)**	**(0.0211)**		
P93* She Age 60 and above	**-0.0117**	**-0.00332**	**-0.00447**	**-0.00201**		
	(0.0175)	**(0.0248)**	**(0.0177)**	**(0.0247)**		
Dm (Agem-60)	0.105***	0.0410**	0.106***	0.0402**	0.115***	0.0267**
	(0.0156)	(0.0160)	(0.0158)	(0.0161)	(0.0104)	(0.0109)
Dm $(Agem-60)^2$	-0.0273***	-0.0112*	-0.0272***	-0.0111*	-0.0317***	-0.00654
	(0.00527)	(0.00578)	(0.00533)	(0.00580)	(0.00373)	(0.00422)
Dm $(Agem-60)^3$	0.00324***	0.00134*	0.00322***	0.00137*	0.00390***	0.000742
	(0.000691)	(0.000795)	(0.000698)	(0.000797)	(0.000511)	(0.000607)
Dm$(Agem-60)^4$	-0.000140***	-5.69e-05	-0.000138***	-6.02e-05	-0.000172***	-3.11e-05
	(3.08e-05)	(3.67e-05)	(3.11e-05)	(3.68e-05)	(2.36e-05)	(2.90e-05)
(1-Dm) (Agem-60)	0.0944***	0.0119	0.0991***	0.0157	0.0624***	-0.00555
	(0.0216)	(0.0174)	(0.0216)	(0.0174)	(0.0154)	(0.0121)
(1-Dm) $(Agem-60)^2$	0.000749	0.00307	0.00136	0.00380	-0.0175***	-0.00367
	(0.00962)	(0.00787)	(0.00961)	(0.00787)	(0.00589)	(0.00471)
(1-Dm) $(Agem-60)^3$	-0.00103	0.000536	-0.000945	0.000627	-0.00384***	-0.000510
	(0.00147)	(0.00123)	(0.00147)	(0.00123)	(0.000843)	(0.000689)
(1-Dm) $(Agem-60)^4$	-5.75e-05	3.10e-05	-5.28e-05	3.63e-05	-0.000192***	-2.27e-05
	(7.25e-05)	(6.23e-05)	(7.24e-05)	(6.23e-05)	(4.02e-05)	(3.35e-05)
Df (Agef-60)	0.0146	0.110***	0.0185	0.109***	0.0116	0.117***
	(0.0126)	(0.0178)	(0.0126)	(0.0178)	(0.00823)	(0.0120)
Df $(Agef-60)^2$	-0.00377	-0.0251***	-0.00477	-0.0251***	-0.00400	-0.0322***
	(0.00455)	(0.00629)	(0.00456)	(0.00629)	(0.00320)	(0.00456)
Df $(Agef-60)^3$	0.000411	0.00306***	0.000568	0.00313***	0.000532	0.00442***
	(0.000634)	(0.000859)	(0.000635)	(0.000859)	(0.000467)	(0.000653)
Df$(Agef-60)^4$	-1.50e-05	-0.000142***	-2.37e-05	-0.000148***	-2.27e-05	-0.000216***
	(2.97e-05)	(3.97e-05)	(2.98e-05)	(3.96e-05)	(2.28e-05)	(3.12e-05)
(1-Df) (Agef-60)	0.00480	0.0755***	0.0125	0.0819***	-0.00847	0.0302**
	(0.0165)	(0.0198)	(0.0165)	(0.0198)	(0.0112)	(0.0146)
(1-Df) $(Agef-60)^2$	-0.000707	0.00517	0.00190	0.00666	-0.00608	-0.0183***
	(0.00769)	(0.00851)	(0.00769)	(0.00855)	(0.00446)	(0.00537)
(1-Df) $(Agef-60)^3$	0.000231	0.000329	0.000593	0.000517	-0.000859	-0.00310***
	(0.00120)	(0.00126)	(0.00120)	(0.00127)	(0.000650)	(0.000742)
(1-Df) $(Agef-60)^4$	3.07e-05	2.58e-05	4.69e-05	3.43e-05	-3.72e-05	-0.000133***
	(5.97e-05)	(6.07e-05)	(5.98e-05)	(6.11e-05)	(3.14e-05)	(3.44e-05)
P93 Dm (Agem-60)	0.0529**	-0.0250	0.0550**	-0.0256		
	(0.0260)	(0.0270)	(0.0265)	(0.0271)		

Table A. Appendix. Continued. Linear Retirement Probability: first stage regressions

P93 Dm $(Agem-60)^2$	-0.0295***	0.00894	-0.0303***	0.0105		
	(0.0113)	(0.0127)	(0.0115)	(0.0127)		
P93 Dm $(Agem-60)^3$	0.00565***	-0.00119	0.00580***	-0.00157		
	(0.00192)	(0.00228)	(0.00195)	(0.00228)		
P93 Dm$(Agem-60)^4$	-0.000346***	5.55e-05	-0.000358***	7.66e-05		
	(0.000111)	(0.000138)	(0.000113)	(0.000138)		
P93 (1-Dm) (Agem-60)	-0.0440**	-0.0228	-0.0418*	-0.0272		
	(0.0218)	(0.0178)	(0.0218)	(0.0177)		
P93 (1-Dm) $(Agem-60)^2$	-0.0267**	-0.00914	-0.0248**	-0.00998		
	(0.0104)	(0.00856)	(0.0104)	(0.00853)		
P93 (1-Dm) $(Agem-60)^3$	-0.00417**	-0.00145	-0.00385**	-0.00156		
	(0.00163)	(0.00136)	(0.00162)	(0.00136)		
P93 (1-Dm) $(Agem-60)^4$	-0.000201**	-7.50e-05	-0.000185**	-8.20e-05		
	(8.09e-05)	(6.92e-05)	(8.08e-05)	(6.90e-05)		
P93 Df (Agef-60)	5.67e-05	0.0747**	0.00102	0.0715**		
	(0.0199)	(0.0295)	(0.0201)	(0.0296)		
P93 Df $(Agef-60)^2$	-0.00242	-0.0496***	-0.00203	-0.0464***		
	(0.00902)	(0.0134)	(0.00914)	(0.0134)		
P93 Df $(Agef-60)^3$	0.000455	0.00977***	0.000328	0.00910***		
	(0.00159)	(0.00235)	(0.00161)	(0.00235)		
P93 Df$(Agef-60)^4$	-2.26e-05	-0.000596***	-1.64e-05	-0.000558***		
	(9.52e-05)	(0.000139)	(9.60e-05)	(0.000139)		
P93 (1-Df) (Agef-60)	-0.0150	-0.0640***	-0.0239	-0.0713***		
	(0.0170)	(0.0198)	(0.0169)	(0.0197)		
P93 (1-Df) $(Agef-60)^2$	-0.00705	-0.0330***	-0.00976	-0.0351***		
	(0.00840)	(0.00923)	(0.00839)	(0.00925)		
P93 (1-Df) $(Agef-60)^3$	-0.00149	-0.00482***	-0.00183	-0.00508***		
	(0.00133)	(0.00140)	(0.00133)	(0.00140)		
P93 (1-Df) $(Agef-60)^4$	-9.33e-05	-0.000222***	-0.000108	-0.000234***		
	(6.66e-05)	(6.79e-05)	(6.67e-05)	(6.82e-05)		
Covariates (Z)	yes	yes	no	no	yes	yes

*** stands for statistical significance at the 1 per cent level; ** at the 5 per cent and * at the 10 per cent. The covariates included are spouses' French nationality and education dummies, number of children, local unemployment rate, year and cohort dummies.

Table B. Descriptives: sample of dual-earner, retiree, other inactive, married couples with both spouses aged 50 to 70 included.

	Husband		Wife	
	Mean	Standard dev.	Mean	Standard dev.
Age	60.776	5.293	58.617	5.239
Age 60 and above	.553	.497	.403	.490
Elementary School	0.531	0.499	0.605	0.488
Middle School	0.292	0.454	0.252	0.434
High School	0.065	0.247	0.075	0.264
College	0.109	0.312	0.063	0.244
French	0.949	0.217	0.957	0.201
Retired	.598	.490	.308	.461
Employed	0.337	0.472	0.317	0.465
Other Inactive	0.063	0.244	0.373	0.483
Usual Hours	41.707	11.950	33.837	13.692

Couple's characteristics		
	Mean	Standard dev.
Married	0.970	0.169
Children number	0.393	0.773
Local U rate	9.368	2.429

Observations no.	*148395*

Note: The sample includes all active and inactive partners aged 50 to 70. It includes also cohabitant couples.
Hours are averaged over positive values of hours.

Table C. Sample descriptives by retirement status on the two sides of the age cut-off, larger sample

	Men in a Couple			
	Not Retired Age 50-59	Retired Age 50-59	Not Retired Age 60-70	Retired Age 60-70
Elementary School	0.415	0.494	0.454	0.623
	(0.492)	(0.499)	(0.497)	(0.484)
Middle School	0.353	0.364	0.180	0.245
	(0.478)	(0.481)	(0.384)	(0.430)
High School	0.077	0.068	0.080	0.055
	(0.267)	(0.251)	(0.271)	(0.228)
College	0.150	0.071	0.280	0.074
	(0.357)	(0.257)	(0.449)	(0.262)
French	0.944	0.970	0.877	0.962
	(0.228)	(0.170)	(0.327)	(0.192)
Children number	0.636	0.396	0.456	0.217
	(0.922)	(0.768)	(0.868)	(0.579)
Local U rate	9.274	9.494	9.301	9.419
	(2.44)	(2.429)	(2.409)	(2.419)
Observations no.	53943	*12271*	*5607*	*76574*
	Women in a Couple			
	Not Retired Age 50-59	Retired Age 50-59	Not Retired Age 60-70	Retired Age 60-70
Elementary School	0.560	0.424	0.723	0.668
	(0.496)	(0.494)	(0.447)	(0.470)
Middle School	0.280	0.303	0.183	0.223
	(0.449)	(0.459)	(.0387)	-0.416
High School	0.083	0.133	0.053	0.061
	(0.276)	(0.340)	(0.224)	(0.240)
College	0.074	0.137	0.036	0.044
	(0.261)	(0.344)	(0.188)	(0.205)
French	0.944	0.983	0.944	0.986
	-0.228	(0.126)	(0.228)	(0.114)
Children number	0.573	0.271	0.229	0.126
	(0.903)	(0.598)	(0.583)	(0.402)
Local U rate	9.324	9.236	9.639	9.338
	(2.4349)	(2.402)	(2.492)	(2.379)
Observations no.	*81619*	*6934*	*20972*	*38870*

Note: The sample includes all active and inactive partners aged 50 to 70, married or unmarried. The total sample size is 148 395 observations.

Table D. Descriptives of treatment and control group.
Dual-earners or retiree married couples with spouses of all ages.

	Husband control group		Husband treatment group	
	Mean	St. Deviation	Mean	St. Deviation
Elementary School	0.543	0.498	0.266	0.442
Middle School	0.274	0.446	0.438	0.496
High School	0.075	0.264	0.109	0.311
College	0.103	0.304	0.185	0.388
French	0.969	0.171	0.956	0.202
Children number	0.646	0.96	1.291	1.065
Local U rate	8.851	2.284	9.554	2.409
Observations number	*157970*		*164244*	
	Wife control group		Wife treatment group	
	Mean	St. Deviation	Mean	St. Deviation
Elementary School	0.557	0.496	0.298	0.457
Middle School	0.255	0.436	0.357	0.479
High School	0.102	0.303	0.175	0.38
College	0.081	0.273	0.168	0.374
French	0.977	0.149	0.964	0.184
Children number	0.67	0.971	1.235	1.072
Local U rate	8.802	2.27	9.558	2.407
Observations number	*148583*		*173631*	

Note: The sample includes dual-earner or retiree married couples of all ages: 322 214 couples.

Table E. Raw differences-in-differences of the 1993 policy change on own retirement.
Dual-earners or retiree married couples with spouses of all ages.

	Sample means of own retirement	
Husbands	Younger Cohorts 1990-1993	Older Cohorts 1990-1993
	0.015	0.892
Husbands	Younger Cohorts 1994	Older Cohorts 1994
	0.036	0.968
Husbands	Younger Cohorts, 1994-1996	Older Cohorts, 1994-1996
	0.055	0.976
Husbands	Younger Cohorts, 1994-2002	Older Cohorts, 1994-2002
	0.119	0.986
Wives	Younger Cohorts 1990-1993	Older Cohorts 1990-1993
	0.018	0.877
Wives	Younger Cohorts 1994	Older Cohorts 1994
	0.037	0.949
Wives	Younger Cohorts 1994-1996	Older Cohorts 1994-1996
	0.053	0.961
Wives	Younger Cohorts, 1994-2002	Older Cohorts, 1994-2002
	0.115	0.979

	Own Raw linear difference-in-differences estimates		
	Estimate	St. Error	Significance
Husbands, policy year	-0.055	(0.003)	***
Husbands, over three years	-0.044	(0.002)	***
Husbands, over nine years	0.01	(0.002)	***
Wives, policy year	-0.05	(0.003)	***
Wives, over three years	-0.049	(0.002)	***
Wives, over nine years	-0.005	(0.002)	***

The sample includes dual-earner and retiree spouses of all ages (see Table 3).

Note: *** stands for statistical significance at the 1 per cent level.

Table F. Probit models of differences-in-differences

Dual-earners or retiree married couples with spouses of all ages.

Marginal Effects of the 1993 Policy Change on the Own Retirement Probability

	Estimate	St. Error	Significance
Husbands, policy year	-0.039	(0.007)	***
Husbands, over three years	-0.038	(0.006)	***
Husbands, over nine years	-0.039	(0.007)	***
Wives, policy year	-0.027	(0.006)	***
Wives, over three years	-0.028	(0.005)	***
Wives, over nine years	-0.045	(0.006)	***

The probits of retirement include -in addition to birth cohort and year dummies- controls for education dummies, nationality, local unemployment rate and number of children younger than 18.

The sample includes dual-earner and retiree spouses of all ages.

Note: *** stands for statistical significance at the 1 per cent level.

Table G. Cross raw differences-in-differences of the effect of the 1993 reform on retirement.
Dual-earners or retiree married couples with spouses of all ages.

	Sample Means of Own Retirement when the Spouse is affected by the policy	
	Wife Y. Cohorts 1990-1993	Wife O. Cohorts 1990-1993
Husbands R.	0.054	0.917
	Wife Y. Cohorts 1994	Wife O. Cohorts 1994
Husbands R.	0.090	0.960
	Wife Y. Cohorts, 1994-1996	Wife O. Cohorts, 1994-1996
Husbands R	0.106	0.970
	Wife Y. Cohorts, 1994-2002	Wife O. Cohorts, 1994-2002
Husbands R	0.167	0.982
	Husband Y. Cohorts 1990-1993	Husband O. Cohorts 1990-1993
Wives R.	0.017	0.778
Wives R.	Husband Y. Cohorts 1994	Husband O. Cohorts 1994
	0.031	0.854
	Husband Y. Cohorts 1994-1996	Husband O. Cohorts 1994-1996
Wives R.	0.04	0.877
Wives R.	Husband Y. Cohorts, 1994-2002	Husband O. Cohorts, 1994-2002
	0.088	0.921

Cross raw linear difference-in-differences

	Estimate	St. Error	Significance
Husbands, policy year	-0.007	(0.0038)	*
Husbands, over three years	-0.0010	(0.002)	
Husbands, over nine years	0.048	(0.002)	***
Wives, policy year	-0.06	(0.003)	***
Wives, over three years	-0.076	(0.002)	***
Wives, over nine years	-0.072	(0.001)	***

The sample includes dual-earner and retiree spouses of all ages.

Note: *** stands for statistical significance at the 1 per cent level.
Y. Young and O. Old.
We measure here the raw effects on the husband's (wife' s) retirement probability of the fact that their partner is concerned by the 1993 policy change. These are indirect (cross) effects of the policies on spouses' retirement.